Multi-Instrument Inter-Calibration Framework

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ROSES 2011-ACCESS

- Advancing Collaborative Connections for Earth System Science
- The primary objective of ACCESS is to enhance, extend, and improve existing components of NASA's Earth Science distributed and heterogeneous data and information systems infrastructure.
- The focus is on applications that improve interconnectedness and information technology software underpinning the advancement of Earth science research.

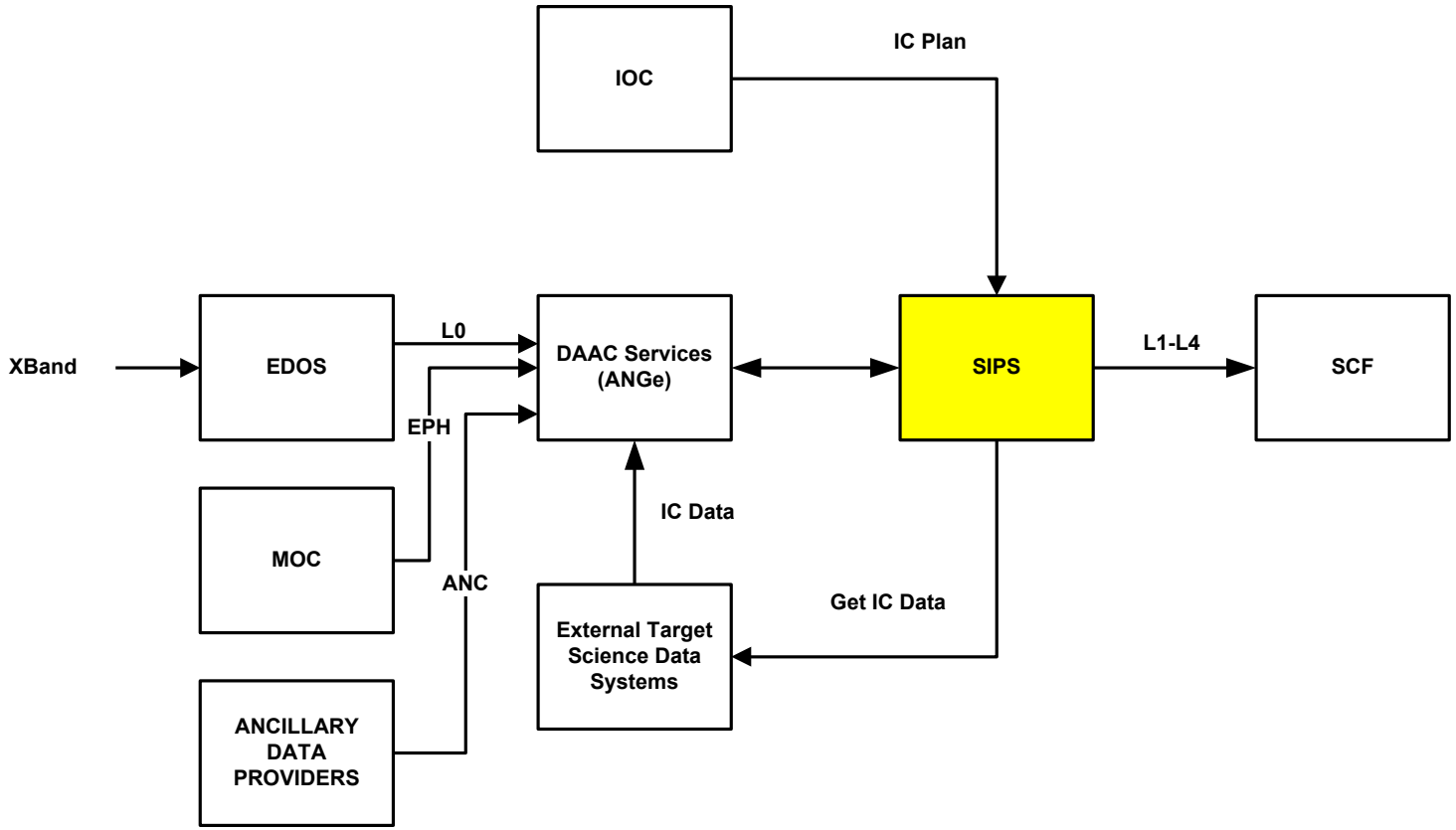
NASA ACCESS Program Manager Steve Berrick

Funding for 2 years (May, 2012 – April, 2014)

Background

- Concepts for the inter-calibration data system came from CLARREO Pre-Phase A studies
- MIIC Framework leverages the brainpower (science and engineering) and computer resources from the CLARREO team
- ROSES Panel findings: “Inter-calibration is bedrock work for satellite-based Earth science; delay of the CLARREO instrument makes this work even more important. ”

CLARREO Data System Operations Concept (Pre-Phase A)

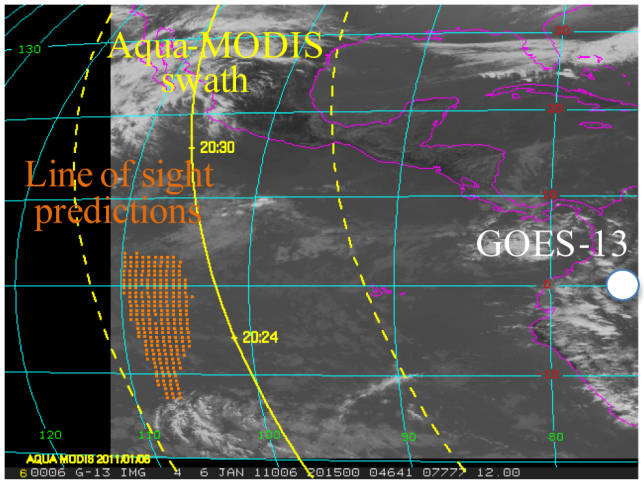


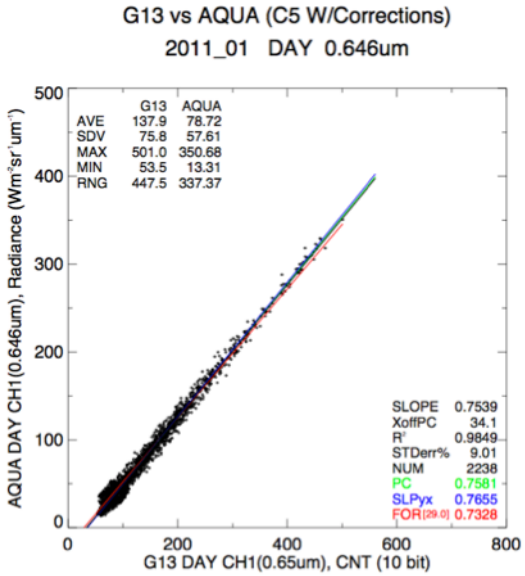
MIIC Framework – What is it? Objectives?

- The MIIC Framework is a reusable extendable collection of software to support inter-calibration
- Provide software tools to link together multiple NASA Earth science data systems in support of inter-calibration
- Focus on backend servers to efficiently access only data needed for inter-calibration (typically < 0.1 % total volume)
- Determine feasibility of OPeNDAP server-side functions
- Support future NASA missions (CLARREO, Venture class, etc.) with a distributed processing infrastructure
- Support instrument scientist Cal-Val activities (JPSS CERES)
- Support inter-calibration goals of WMO GSICS

GEO-MODIS Heritage Process

(Doelling)



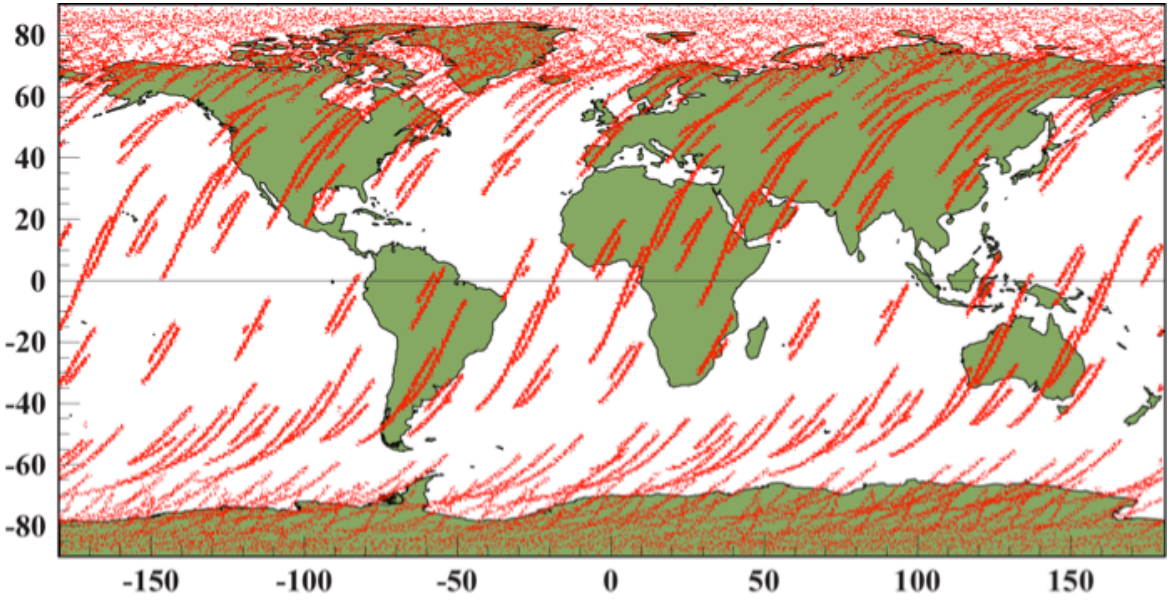


The predicted 0.5° latitude by longitude matched regions overlaid on the GOES-13 visible imagery for Jan 6, 2011 at 20:15 GMT. The GOES-13 sub-satellite point (75°W) and Aqua-MODIS ground track is also depicted. Scatter plot shows 2238 matched regional radiances for GOES-13 and Aqua-MODIS for January 2011. Linear regression determines monthly gains which to trend over time.

Event Prediction

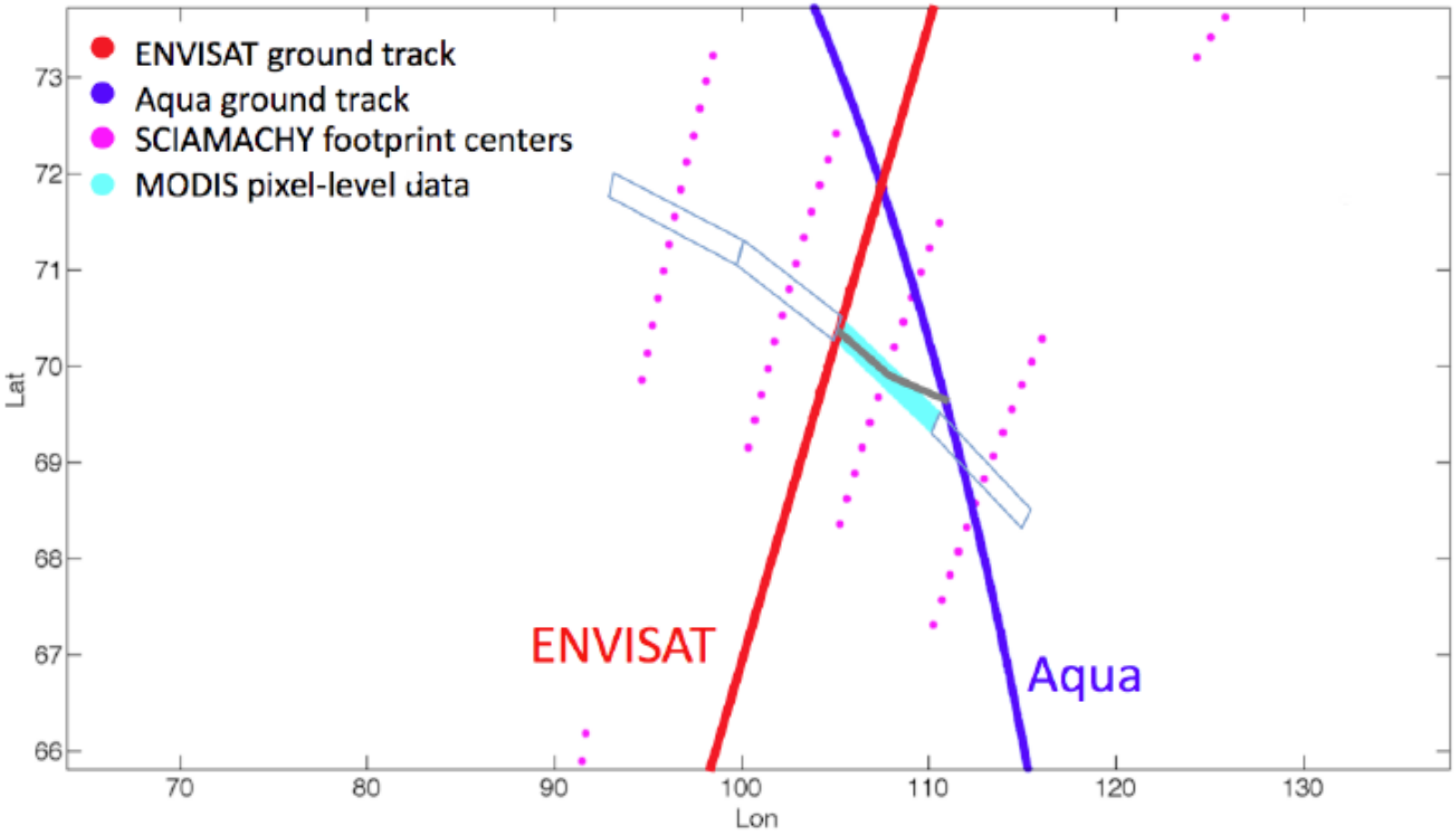
(Lukashin, Roithmayr, Speth)

Re-use CLARREO developed algorithms to predict matched angle/space/time measurements for GEO and LEO instruments. Code into reusable modules.



Matched CLARREO RS with JPSS cross-track IFOVs for one year of data

Server-side Spatial Convolution (Doelling)



Average 1km MODIS pixels within SCIAMACHY 30 km x 240 km footprints

Server-side Spectral Convolution

(Doelling)

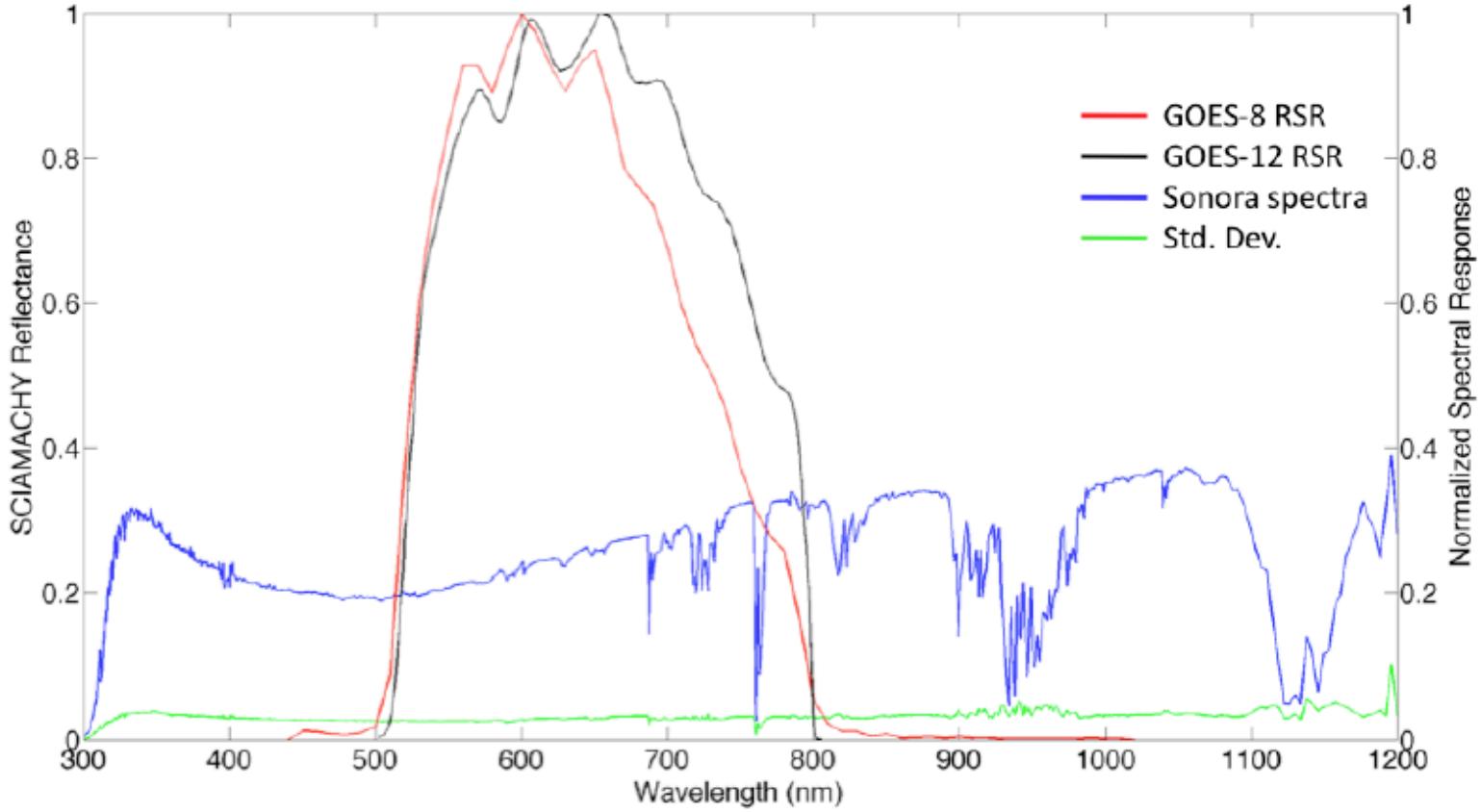
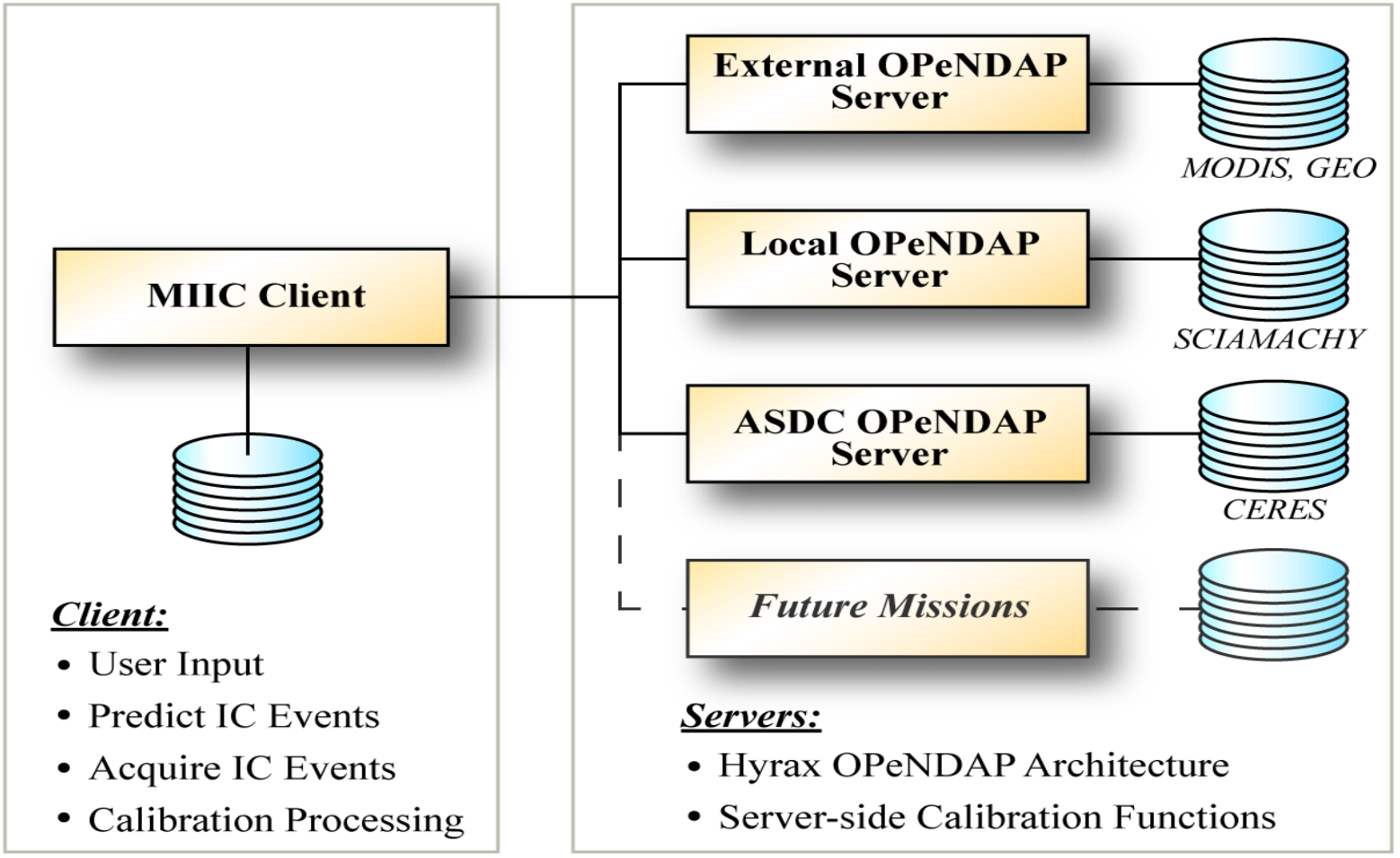


Figure 11: Normalized spectral response functions of GOES-12 (red line) and GOES-8 (black line), along with the 2003-to-2010 mean (blue line) and standard deviation (green line) of the 31 SCIAMACHY-footprint clear-sky TOA reflectance spectra over the Sonoran desert.

Architectural Concept



Partnering with OPeNDAP

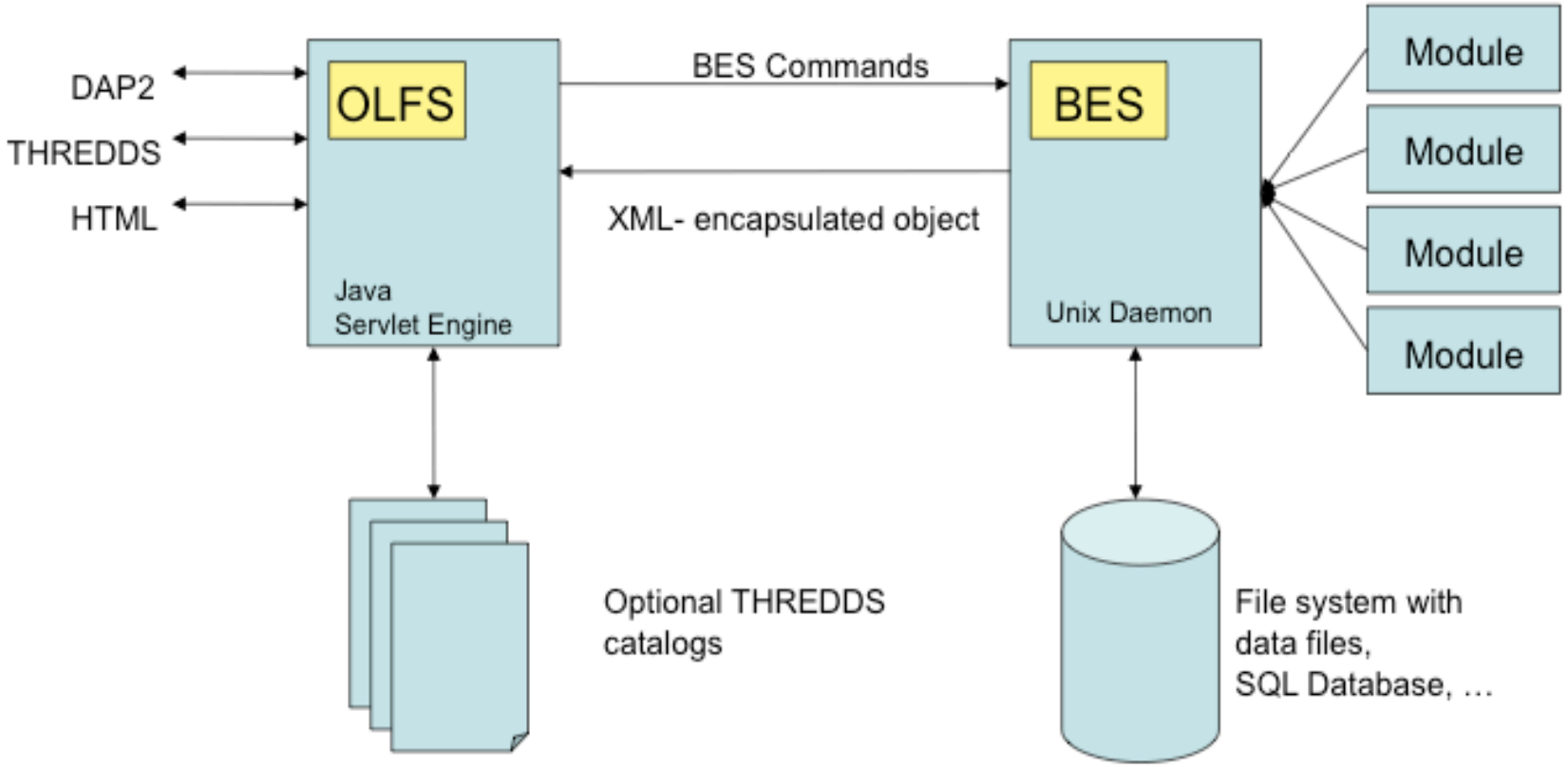
(J. Gallagher)

- OPeNDAP is both the name of a non-profit organization and the name of a protocol used to exchange scientific data across the World Wide Web.
- Used in all major NASA Earth Science DAACs
- Supports file formats such as HDF and netCDF; abstracts details
- Converts data into XDR binary that are transmitted over network using DAP protocol
- Provide both client and server software
- Our goal is to demonstrate the feasibility of using OPeNDAP within an automated system to efficiently access and process data using server-side functions

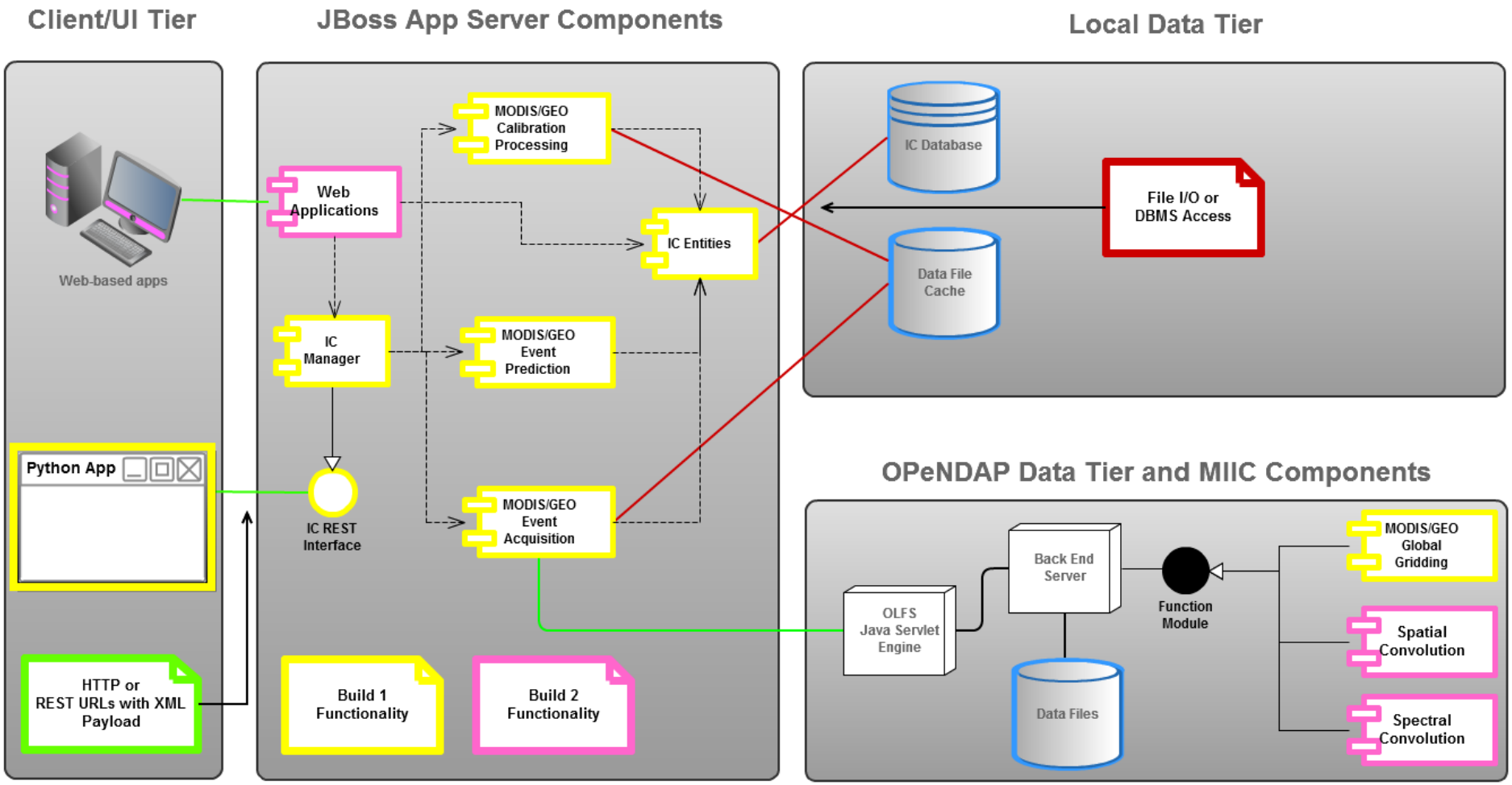
OPeNDAP Hyrax Backend Server Design

(J. Gallagher)

Data Descriptor Structures (DDS),
Data Attribute Structures (DAS)



Multi-tiered Architectural Design
(Aron Bartle)



Status

- Formulation Phase
  - Subcontracts in place with OPeNDAP and Mechdyne
  - Requirements analysis and Architectural design
- Build 1 due Jan., 2013